

**LTS Science and Technology Roadmap  
Technology Paths Development Workshop /  
Executive Committee Meeting  
Adams Mark – Orlando Hotel, Orlando, FL  
March 18-21, 2002**

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A Technology Paths Development Workshop and Executive Committee Meeting for the LTS Science and Technology Roadmap was held on March 18 – 21, 2002, at the Adams Mark Orlando Hotel in Orlando, FL. The following objectives were addressed during the meeting:

- Ground/solidify workgroup assumptions regarding immediate site needs in the LTS arena by hearing and querying representatives from current closure/LTS sites (e.g., Mound, Fernald, Rocky Flats) regarding closures and LTS activities
- Identify and rank technical approaches to meet LTS S&T objectives
- Document various technology development paths and applicable down-select points for each technical approach
- Draft an initial recommendation for DOE regarding necessary S&T activities for LTS.

Attendees were as follows:

**Board of Directors (Day 3)**

E. Larry Davis (EC Chair), BWXT Savannah River Company  
George Apostolakis, Massachusetts Institute of Technology  
J. Lane Butler, Kaiser-Hill Company, LLC  
Lorne G. Everett, The IT Group  
Shah Choudhury, DOD Environmental Cleanup  
Howard Roitman, Colorado Department of Public Health and Environment  
James Woolford, Environmental Protection Agency  
Clay Nichols, DOE-Idaho Operations Office  
Bruce Hallbert, INEEL Roadmapping Project Manager

**Steering Committee / Working Groups Chairs**

David J. Borns, Sandia National Laboratories – Monitoring and Sensors  
James H. Clarke, Vanderbilt University – Contamination Containment and Controls  
William R. Freudenburg, University of Wisconsin-Madison – Decision Making and Institutional Performance  
James V. Mohatt, JVM and Associates – Safety Systems and Institutional Controls

**Working Group Members**

Chris Beck, Project Enhancement Corporation – Monitoring and Sensors  
Dawn Kaback, Concurrent Technologies Corporation – Monitoring and Sensors  
Horace Moo-Young, EPA Research Fellow, Lehigh University – Monitoring and Sensors  
Bridget Scanlon, University of Texas – Monitoring and Sensors  
Mike Serrato, Savannah River Site – Monitoring and Sensors  
Everett Springer, Los Alamos National Laboratory – Monitoring and Sensors  
Ron Wilhelm, Environmental Protection Agency – Monitoring and Sensors

R. Jeffrey Dunn, GeoSyntec – Contamination Containment and Controls  
Margaret MacDonell, Argonne National Laboratory – Contamination Containment and Controls  
Ellen D. Smith, Oak Ridge National Laboratory – Contamination Containment and Controls  
Robert D. Waters, Sandia National Laboratory – Contamination Containment and Controls  
W. Jody Waugh, MACTEC-ERS – Contamination Containment and Controls

Lee "Chip" Clarke, Rutgers University – Decision Making and Institutional Performance  
Deborah Griswold, Albuquerque Operations Office – Decision Making and Institutional Performance  
Elizabeth K. Hocking, Argonne National Laboratory – Decision Making and Institutional Performance  
Thomas M. Leschine, University of Washington – Decision Making and Institutional Performance  
Thomas Marshall, Rocky Mountain Peace & Justice Center – Decision Making and Institutional Performance

Norman Brandon, Creative Concepts – Safety Systems and Institutional Controls  
David French, Aspen Resources – Safety Systems and Institutional Controls  
Gary M. Bratt (for David Johnson, University of Oklahoma Health Sciences Center)  
Donald Paine, Nuclear Fuel Services, Inc. – Safety Systems and Institutional Controls  
Kimberley Ann Peone, Critical Data Tribal, LLC – Safety Systems and Institutional Controls  
Darby C. Stapp, Pacific Northwest National Laboratory – Safety Systems and Institutional Controls

**Technical Support / Facilitation**

Bryan L. Parker, Lead Facilitator  
Mark Gladstone, Gladstone Group, Facilitator – Monitoring and Sensors  
Doug Hamelin, Logistics Support/Facilitator – Contamination Containment and Controls  
Lori Braase, Facilitator – Safety Systems and Institutional Controls

**INEEL Roadmapping Core Team**

Steven J. Kowall  
Rafael Soto

**Guest Presenters / Sites Operations Representatives**

David Freeman, Savannah River Site  
Marty Prochaska, Fernald  
Kliss McNeel, Idaho National Engineering and Environmental Laboratory

**Other Attendees**

Jeffrey J. Short, DOE Office of Long-Term Stewardship  
C. Brooks Weingartner, DOE-ID National Long-Term Stewardship Program  
Harold Blackman, ET&E Division Director, Idaho National Engineering and Environmental Laboratory  
Steve Wassersug (DOE-ID Guest), Global Environment & Technology Foundation  
Bob Katt, Robert Katt & Associates, Inc.

Summary proceedings of the four-day meeting appear below.

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**Day 1 – March 18**

**Steering Committee Meeting (7:00 am)** – Three of the four working group chairs met prior to the Executive Committee meeting to discuss primary objectives of this workshop and the near-term prioritization needs of DOE. Brooks Weingartner explained that Clay Nichols will be meeting with other DOE project managers within the next two weeks to discuss the status and fundability of current Focus Area projects. As such, Clay needs an initial analysis of needed LTS projects within the current EM portfolio so that he can argue for FY03-04 funding. The question of what Clay had in mind as deliverables to meet this need was raised, and the following items were identified by Brooks:

- Some of these techniques/technologies need to be started now; this is the key.
- Take the operations perspective/needs and match up with what LTS is working on to identify the real focus. (Technology needs and paths to closure.)
- Include the spreadsheets of what was considered how it they were ranked.
- Our customer likes graphics summaries and processes and summaries.
  - Examples: Consumer reports dots. Red-Yellow-Green, etc. Simplified graphics.
- Organize what you have done and where you are now into a two-page description of things to consider and the top ten technologies to consider.

- Input information from mid-year reviews.
- Summary specific guidance from LTS-S&T workgroups.
- Philosophical guidance (e.g., “more emphasis on caps”)
- Where is your thinking today?

Dave Borns and Jim Clarke raised concerns that (1) we haven’t had time to do a detailed analysis of the current portfolio, currently planned as part of the May workshop, and (2) that projects in the current portfolio aren’t targeted at LTS, hence our focus on new projects and technologies that are needed to adequately address LTS issues. The chairs requested that Clay Nichols join us so that they could query him directly regarding his specific needs.

Clay Nichols explained his assumption that this group would understand more than most the priorities associated with the subcontamination program (as part of our LTS and other associated work). As such, the Steering Committee would be able to offer some guidance on what is being done and what needs to be done to move forward. Additionally, several of the members of the working groups (Mike Serrato, etc.) have been intimately involved in subcontamination work. Any summaries or guidance that the Steering Committee could give from the work completed to date would be useful in helping DOE prioritize their work. Dave Borns again expressed concern that we had somewhat avoided a review of existing projects in the EM portfolio so that we could focus more on the needs, rather than on the status quo. Clay commented that it is those needs that are critically important to the process. He doesn’t expect a review of current projects, just an indication of the current LTS thinking so that he can argue for the priorities, etc. as part of upcoming budget cycles.

Bryan Parker quickly outlined the process flow for the next two days of workshops and highlighted the anticipated results (i.e., 30 – 40 high-impact targets and the needs upon which those targets are based). He then asked if that information was what Clay was looking for and whether it would be useful to him. Clay confirmed that the information would be invaluable to the process. Bryan confirmed that the “two” primary deliverables that could be delivered to Clay are (1) a initial indication of the site needs, as part of Tuesday morning presentations, and (2) information resulting from Working Group sessions on Tuesday and Wednesday. Bruce Hallbert commented on the S&T Roadmap process, highlighting processes changes and current direction.

- At the Dallas meeting, Workgroups developed sets of capabilities [to perform LTS activities] with significant S&T components. They assessed the level of impact (high, medium, low) of the capability to reduce cost, risk, and uncertainty.
- At the Orlando meeting, Workgroups will pick the activities (meaning capabilities) with high impact and develop technical pathways to realize the technologies/techniques (i.e., the tasks required to achieve the target defined for the capability)
- At the May meeting, Workgroups will integrate the pathways, “prioritize” pathways and alternatives (see below), and review the draft report.

Jeff Short joined the group and confirmed Clay’s understanding of prioritization needs and added that we need to provide some indication of how our efforts supports Jessie Roberson’s Thrust 1 and Thrust 2 efforts, with ties to Theresa Fryberger’s organization. Additionally, he noted that there is no funding earmarked for this effort, other than carry over, for the next fiscal year. As such, if we intend to do additional work beyond this fiscal effort, we need to justify it and get it into the budget so that DOE can accommodate the work. The following issues were also raised:

- Two headquarter meetings with focus for LTS.
- Review with the Transition team (Jim Owendoff, Paul Kruger, Clay Nichols, etc) the input from focus areas and cut it down to areas that have a greater chance of success.
- Dave Geiser wants Clay to give an update early in April on the LTS Roadmap status.

- Are we focusing on closure issues with Rocky Flats and Mound? Do we want advice on how to close sites or how to close sites with LTS in mind?

Dave Borns clarified that one of the key issues/problems is that we are at such a “generic” level in terms of our needs that prioritization may not be helpful. For example, our current level of thinking is “sensors.” But it will take a minimum of \$1M per sensor to develop the technology. If only \$10M are available, which sensors do you develop? We need to get to a point where we can say X sensor is needed for Y reason. Right now, we anticipate 8 to 10 technology paths per working group, based on the anticipated results of this workshop.

The discussion then moved to the focus of the May workshop, with some confusion as to the intended outcome of that meeting. Steve Kowall explained that the starting point of the May workshop would be an early draft Roadmap with a focus on tying up loose ends to deliver a Roadmap document to DOE. Dave Borns pointed out that the plan over the recent weeks was to have all the workgroups present to “prioritize” the work prior to drafting the Roadmap document. Additionally, he expressed concern that a prioritization scheme was being developed independent of Workgroup input. Bryan Parker explained that a couple of the agenda items for the EC Meeting are planning the focus for the May meeting and a presentation on the prioritization model being developed by Jerry Harbour at the INEEL.

Steve Kowall re-emphasized that the objective of this effort is to develop an LTS Science and Technology Roadmap document that will be useful to DOE regardless of who has responsibility for LTS. Jim Clarke noted that one of the disconnects to this point has been the request to focus on LTS OR technology development. He advocates that we need to focus on both if we expect to have an impact.

Bruce Hallbert briefly joined the group and was asked to highlight some of the work being done by Jerry Harbour regarding prioritization. He expressed his desire to sit down with the workgroup chairs to discuss the prioritization process, particularly how we could prioritize between such diverse views and areas as our workgroups are addressing. He added that to this point, Jerry Harbour’s group has been working independently so that the workgroups would have time to get further along in their effort to identify the specific needs that will factor into the prioritization process.

A key issue was raised in that the May meeting was originally planned without attendance from all the workgroups. Since Dallas, however, the Steering Committee has been under the impression that the May meeting would include all members of the team, noting that prioritization should be done with input from everyone on the team. All the work to date has been done with the expectation that workgroups would have input into that process and would be able to help develop that process so that it results in a product that the workgroups can use. The full intent is to get the workgroups fully involved with the prioritization developers to ensure that the product is “right”. Appendix A captures key concerns raised by the workgroups chairs regarding the proposed prioritization process.

Given time constraints imposed by the EC meeting, the discussion moved from prioritization to preparation of status presentations by the Workgroup chairs to the Board of Directors.

**Executive Committee Meeting** – The BOD meeting began with Clay Nichols (DOE-ID) sharing expectations DOE has for the roadmap, namely, a Roadmap that gives DOE guidance on making thoughtful decisions regarding LTS S&T. The expectation of the BOD is to give guidance to the effort and help identify priorities within the technology portfolio (i.e., define what we do not have vs. what we need to have). A discussion of the “As Is/Desired State” of the Roadmap project produced the following actions:

#	Action Item	Designee
1	Proposed action change GA to Clay Nichols/Bryan Parker. <ul style="list-style-type: none"> <li>Communicate to DOE's management intent.</li> <li>BOD need page 2,3,27 paragraphs (top-to-bottom) send information to Bryan Parker</li> </ul>	02/25/02 Input to Bryan Parker
2	<ul style="list-style-type: none"> <li>Consider WBS EM-50</li> <li>How does this effort support (TTB) "has relevance."</li> <li>Road mapping "How does it fit in?"</li> <li>Tie back to needs from sites.</li> </ul>	04/02/02 Draft 04/09/02 Final
3	<ul style="list-style-type: none"> <li>Assure alignment with expectations of Clay Nichols &amp; Jim Wolford.</li> <li>Visit with Jim Owendoff first.</li> <li>Consider Teresa Fryberger discussion OST.</li> <li>Jesse Meeting (after 4/15/02)</li> </ul>	04/01/02 report back  Jesse mtg 04/15/02 after
4	How does BOD get involved in prioritization process? <ul style="list-style-type: none"> <li>Schedule/(process for endorsements/milestones/decision making.</li> <li>Direction/guidance to work groups.</li> </ul>	BOD
5	Develop a resolution (guidance to steering utilization component. TTB review as primary component. <ul style="list-style-type: none"> <li>Vote on resolution before leaving Orlando.</li> <li>Make sure we know where Work Groups are going and when they have arrived.</li> <li>Sharpen focus/alignment.</li> </ul>	BOD
6	Reconvene BOD to address issues/actions post-WG chair discussion.	
7	Assure all WG Chairs have copy of TTBR document. Charter Review <ul style="list-style-type: none"> <li>Objectives</li> <li>Process Results to date</li> <li>Interfaces within DOE and outside</li> <li>Schedule where you are – scope</li> </ul> Penetrating questions "lines of inquiry." Self-assessment. Questions we ask of ourselves	

### **Work Group Reports**

*David Borns (M&S).* One activity write-up is still needed; the workgroup is currently vetting write-ups with the vadose zone monitoring community.

- Larry Davis: What was the process?
- Dave Borns: To avoid just a technology push from research community, got people from regulatory/user community and others with user perspective. In the workshop, the workgroup used criteria presented by facilitators and only picked the activities that were rated high on impact across the board (cost, uncertainty, risk). There are enabling paths/procedures in the activities/capabilities, as well as technologies. The group used a gap analysis approach.
- Larry Davis: Was prioritization primarily with regard to M&S versus integration with other groups?
- Dave Borns: Just our group's analysis, but we used multiple written analyses as a basis for what the impacts would be. We also used state guidance, like Ohio EPA, and other sources external to the experience of the M&S group.
- Question: Did you benchmark against existing technologies.
- Dave Borns: We worked with EPA guideline docs on characterization monitoring, other baseline descriptions of groundwater monitoring techniques. What we didn't include was gap between state-of-the-art and state-of-the-practice at DOE sites (major lags in latter).

- Larry Davis: What are the impacts relative to thrusts 1 and 2?
- Dave Borns: The barriers to implementation are largely institutional, regulatory, and policy, not S&T. NRC/NAS has addressed this issue of impediments to incorporating new technology and scientific results. Those reports say there has to be an economic incentive to move sites to use new technology. Maybe the Board can address this in a preamble or summary, dealing with non-technological impediments to improved technology.
- Larry Davis: Do we have an obligation to say that there is a way to improve capabilities that exists but doesn't get used? Perhaps we owe guidance to the "technical assistance" teams to note useful technologies that are being used. We need to capture this in the report.

David Borns continued his remarks to the BOD by commenting on setting up metrics for improving a capability (these are the quantitative targets, or at least quantifiable, measurable results.) A discussion of information flows between work groups then ensued.

- Larry Davis: Have we integrated priorities across working groups?
- Answer: The is yet to be done, but we've shared work products across group, in terms of priorities that go across groups.
- Shah Choudhury: Returning to point that success in implementing new technologies is by word of mouth. How do we get more dissemination and acceptance to overcome this barrier?

This question led to a discussion of issues regarding how to get technologies deployed, involved in RODs, and not just demonstrated at a site.

*Jim Clarke (CC&C).* The CC&C group left Dallas with a high number of "high" ratings, but later decided to work only the capabilities with at least 2. Two are in the activity to monitor and evaluate system performance, which will involve interaction with M&S. Some address Thrust 1, and some address Thrust 2. The workgroup took a liberal interpretation of date for significant impacts. A good example is the activity to engineer the biogeochemical environment. One target was to reduce cost of pump-and-treat by 20%. One way to do that was to replace pump-and-treat with other technologies. That dovetails with capability to stabilize and reduce toxicity/mobility. The area of accommodating environmental change had 9 targets. The workgroup plans to revisit Dallas work to make sure they haven't left out something. Also, they want to look at single high-impact capabilities to see if any should be included.

- Larry Davis: I've asked the Board members to write down questions that workgroup chairs can use as a form of self-assessment, as a QA check.
- Bruce Hallbert: For example, could we identify specific cases or activities at sites where impact from a recommended capability could be demonstrated?
- Question: Can the product be delivered on the schedule?
- Answer: Yes. This question led to a discussion of what can be accomplished by specified times (work product), particularly with changes in work requested.
- Larry Davis: The Board intends to use the resolution process to give the workgroups written guidance on what the process is.

*Jim Mowatt (SS&IC):* Brainstorming items we captured in Dallas by the SS&IC workgroup and organized by their associated targets. Targets and their respective status are as follows:

1. Optimizing maintenance system – the homework assignment has been written

2. Maintenance and ? schedules for active and passive controls.
  3. Develop methodology for selection of safety systems – We looked at what could be used at the nine closure sites. We also looked for commonalities, but that would change if the goal for schedule of completion moves out (to include more sites)
  4. Maintain intergenerational database – Kim Peone is looking at what archives and museums do; she is also looking at what her tribal constituents do (oral history).
  5. Identify commonalities among the [nine] sites – We will probably have some more highs when we look at expanded risk criterion.
  6. Identify potential legal strategies to provide control of the site and maintain requirements on recipient of site.
- Question: What about interpretations of cost, risk, and uncertainty?
  - Jim Mohatt: We used a narrow definition of reducing risk, based on instructions. We will need to revisit that with expanded definition.

*Bill Freudenburg (DM&IP):* Integration with other groups is important. The DM&IP workgroup overlaps with Jim Mohatt's group in various concerns, despite big differences in technical expertise of the groups. State-of-the-art and state-of-the-practice are both at early stage in this area. We need pilot tests with some facilities, trying out different techniques in more or less controlled conditions. There is some concern in the workgroup that the targets of the process seem to keep shifting.

Bill added that the report needs to say there are two ways to save money. Focus on the long-term allows you to save big money; short term, as required for this project, only gets incremental savings. [A significant issue was identified in that the four groups worked with different interpretations of time frame for targets and when impacts had to be realized. M&S used 2008 for implementation, but evaluated impacts on life cycle basis. DM&IP used 2008 target for implementation and near-term results only. CC&C used 2008 implementation and a narrow definition of risk reduction. SS&IC used targets beyond 2008 and long-term impacts.]

A discussion of stakeholder involvement [primarily with CRESP, Consortium for Risk Evaluation with Stakeholder Participation) then ensued.

#### **Prioritization Process.**

The discussion led off with Bruce Hallbert reviewing his interaction with the workgroup chairs during the morning meeting and the overall issue of prioritization.

- *Jim Clarke:* My concern is when we do this. We don't want the workgroups to prioritize their product independent of each other. We need to deal with overlaps, cross-cuts, dependencies.
- *Larry Davis.* Do we need an integrated priorities team?
- *Answer.* Yes. The comment led to a discussion of what prioritization should be and of the desired outcome.
- *Bruce Hallbert:* Jerry Harbour's group (at the INEEL) has done some thinking on how you could prioritize across groups. But it's really the workgroup chairs' process, and they need to talk with [Harbour] about what they want [and he will work it up for them].
- *Larry Davis:* I want us to use the cost reduction structure set up in the Thrust 2 document.
- *Howard Roitman:* How do we get clear cost identification across groups?
- *Shah Choudhury:* Do we need to include increases in efficacy?
- *Howard Roitman:* We need to put a draft in front of the stakeholders and let them assess the priorities.

- *Comment:* Dave Borns is right; you need to look at the interdependencies before you rank them.

#### **Discussions of Major Themes.**

- *Question:* Do we need to relate near-term/long-term impacts with limitation to Thrust 1/Thrust 2 or go beyond them?
- *Clay Nichols:* We need to deal with Thrust 1/Thrust 2 and with long-term paradigm shift in what stewardship should be.

### **Day 2 – March 19**

#### **George Apostolakis Presentation: Environmental Decision Making Involving Multiple Stakeholders**

This presentation addressed work funded by DOE after an NAS committee (Building Consensus, 1994) recommended that risk assessments involve stakeholders and include social, cultural, etc., values, as well as assessment of health and environmental risks. The 1996 NRC report *Understanding Risk* included an integrated process involving analysis and deliberation. Per the report, “Analysis uses rigorous, replicable methods ... ;” the report also included a definition of “deliberative.” George was involved in a case study of closure at Sandia Labs of a disposal site with solvents, PCBs, metal acids, lab trash, misc. debris.

- *Identification of stakeholders.* Only of 30 of those contacted and interviewed agreed to participate in 5-6 workshops over period of 8 months. One participant, a real estate agent, was a woman in her 70s that is still in business. Based on those workshops, six action alternatives were to be evaluated, using decision theory and an analytic-deliberative process.
- *Conduct of the case study.* Formal analysis requires objectives for what is important, performance measures, and relative weights of the performance measures. How does the decision option rate with respect to each of the performance measures (utility functions) and “decision rule” (from decision theory). Decision rule was applied to each stakeholder separately and to each option. Utility weightings were applied to outcomes of “good” “moderate” and “bad.” Final conclusions from the case study were as follows: (1) formal analysis does have value, and (2) in some cases, formal analysis can help to reach stakeholder agreement. In summary, decision theory does work, since you can have subjective measures.

#### **Operations Briefings (see Attachment E)–**

##### **Larry Davis comments [see brief slides]**

Presentations are biased to the needs at the closure sites (“near term considerations”). Operators from sites are here to talk about their needs. EM thrusts for it’s technology program are: Thrust 1 – Closure site support, and Thrust 2 – Alternatives and step improvements to current high risk/high cost baselines. The key issue to keep in mind during the site presentations is “What should the S&T focus be to support LTS?” with a focus on LTS implications of remedial actions and waste disposal. Instructions to board members: come up with “lines of inquiry”, coming out of operational needs presented this morning, to pass on to the working groups as part of self-assessment.

##### **Rocky Flats – Lane Butler.**

*Slide 1:* RFETS is assuming that nuclear material can be moved to other sites, so there is no plan for long-term storage of nuclear materials. D&D of buildings, many of which have orphan waste streams, is the approved remedial action. Additionally, underground process lines were used for all kinds of radiological and chemical hazards, and we need to detect, characterize, and clean up/remove these lines. We are trying to get the cleanup done by 2006.



*Geologic Setting slide:* Thick claystone lies between the surface groundwater and the nearest aquifer. As such, contaminated water exits into surface water before it leaves the site. Pu and U have been immobile; the problem is mostly volatile organic compounds. Using barrier systems for VOCs. Most of the time, wells are dry, so pump and treat is not an option.

*Regulatory Framework slide:* RFETS cleanup falls under CERCLA and RCRA, administered by the Colorado Hazardous Waste Act. Most of work is done under RCRA Accelerated Actions, divided into routine actions and non-routine actions. Remediation strategy has contaminated soil being removed and disposed of off-site, with contaminated groundwater being treated with a passive barrier treatment systems. Problems with handling the waste streams being produced [from D&D] may keep them from meeting the closure goal (by 2006). Landfills will be covered with evapotranspiration covers.

Long-term stewardship will be needed to monitor the residual contamination on the site.

- *Response to Questions:* A wildlife refuge will be the buffer zone, with limited human access to the wildlife refuge. The site will NOT be an open recreational area. DOE will manage the core industrial area, and there will be monitoring systems around the covered landfills. There are some issues about the reactive barrier affecting endangered species, and a question of looking at opening up remediation based on new technology during CERCLA five-year reviews. RFETS has included evaluation for LTS considerations in their current cleanup work. Discussions are still open regarding the land use at the site. There is also a question about how the remediation approach protects the surface water. We are still working on determining the flows in groundwater, but remediation of the groundwater was determined to not be necessary since RFETS uses a barrier systems to funnel groundwater to accessible basins where treatment occurs.

**Mound site – Don Krause.**

Mound was part of the Manhattan Project. Miamisburg city has grown up around the site, and the Greater Miami River runs about a quarter-mile from the site. The city of Dayton is across the river. The 104 acres of buffer area have never been used. Site was sold to City of Miamisburg for industrial park, pending cleaning up to industrial standards. MMCIC areas on slide 6 are the areas already transferred to the city.

The O&M plan is the regulatory document. Most of buildings are being demolished, but some are being transferred with the land. Probably 100+ businesses are already active on site in the transferred buildings. One underground facility, which is located next to above-ground buildings already transferred, is too big to D&D and will need to continue to be monitored. Two hill areas with “test fire valley” lie in between. One waste pit on site is being remediated with a resident a pump-and-treat system.

Deed restriction prohibits installation of wells without prior regulatory approval, and there is a need to monitor installation of wells on site. Levels of metals have been detected (see slides for other issues).

- *Response to Questions:* DOE is retaining liability for the site, so the oversight of deed restrictions, etc., are still under DOE responsibility. Approach for oversight and monitoring activities has been agreed upon by Ohio EPA, etc. How to deal with wells hasn’t been decided (capped or filled). We are looking for technologies to monitor for deed restriction violations after the DOE leaves.

**Fernald Site – Donald Paine.**

We have identified 24 S&T areas where we need work: 16 needs have nothing to do with LTS; 8 priority areas are directly related to LTS. There will be a large On-Site Disposal Facility (OSDF), and the rest will go to NTS or to a commercial disposal facility. OSDF is the LTS priority site. Slide 2 is the OSDF with disposal cell 1 capped. Cells 2 and 3 are in the process of being filled. There will be 7 total cells in OSDF when it is completed. Sensing devices are being installed, and there is a leak detection and collection system beneath the cells. We are planning to continue collecting data for 3-4 years post-closure.

Slide 3 highlights post-closure conditions that will limit on-site capabilities. LTS is not really part of the closure contract since “The post-closure guy gets to take care of all that.” We still have to calibrate the sensor system and figure out what all the data mean. Bottom of slide 5 has priority needs for closure; the major contaminant of concern is uranium. Another was pump-and-treat on a large plume that was off-site. The plume is now on site, and Fernald will continue pump-and-treat until source terms have been remediate. Fernald also needs a long-term data and image repository for monitoring data, as well as a “passive leachate treatment” system. Bottom of slide 6 identifies additional issues that the advisory committee has identified (not part of current contractor’s responsibility). These include cell integrity issues, ecological/geochemical issues, general maintenance issues, etc. The monitoring estimate looks small, but it may grow. Numbers given are costs to apply the technology we’ve chosen to use.

**Savannah River Site – Dave Freeman.**

SRS is looking at LTS on a facility-by-facility basis, not on a site basis. LTS begins after deactivation of a closed facility. The key thrust of our LTS needs is cost reduction of baseline for facility LTS pending final disposition. Slide 4 addresses remote monitoring of inactive facilities. We need help in disposing of or surveillance of materials that are driving up costs (e.g., DU, heavy water from reactor moderator, unexposed fuel rods).

- *Response to Questions.* Groundwater remediation/monitoring system is not seen as part of LTS and, as such, are not integrated with LTS or site D&D. At present, remedy actions are separate from LTS considerations. We cleaned up outside the building, rather than cleaning building first, then the outside. We could integrate the remedial actions with LTS through the Environmental Management System on site. Site priorities are on disposing of high-level wastes.

**INEEL (LTS S&T needs) – Kliss McNeel.**

INEEL is more like SRS than the other sites discussed in than it is not imminently going to closure. INEEL is 890 square miles. We are currently using bioremediation on a plume that original the ROD specified as pump-and-treat only. LTS needs at the INEEL are in the areas of groundwater, soil, air, biota, and containment.

**Panel Discussion –**

- *Question:* What have been biggest cost drivers for LTS?
- *Paine:* At Fernald, it’s data collection and management costs.
- *Krause:* At Mound, programs are focused on closure, not LTS. Cost is probably in the areas of data management collection and closure.
- *Question:* How many have LTS integrated into their baseline?
- *Answer:* none.
- *McNeel:* that’s something we’ve been trying to get identified as an issue, getting life cycle cost.

- *Paine:* There is community interest at Fernald in LTS; we did some things before “cost and schedule” became dominant.
- *Krause:* At Mound, we’re going to have some remaining buildings, but long-term activities are not defined.
- *Question:* If costs aren’t built into the baseline, are costs of LTS being factored into remedy decisions?
- *Paine:* At Fernald, we’re trying to build in some sense of costs for the OSDP site. We haven’t defined it for groundwater monitoring, for example. The reality is that LTS isn’t integral to remediation activities.
- *Question:* Is there any likelihood at Fernald that groundwater won’t be cleaned up?
- *Paine:* That’s why the agreement for advanced wastewater treatment plant goes until water cleanup is complete, not just to 2006 (so ongoing pump-and-treat is possible).
- *Krause:* The driver (at Mound) is to reduce the federal presence on site.
- *Question:* Is there a trade-off for remediation vs. continued monitoring?
- *Paine:* That was in effect done when the decision was made to keep some contaminated material on site or send it to Envirocare. There is a dominance of short-term thinking.
- *Krause:* We are working with focus areas to get cost and performance data on new technologies to determine whether they are viable for LTS at other sites. The important driver is satisfying what the public wants. We’re allowed to clean up to brownfield, which gives us a lot of flexibility over greenfield standards for closure.
- *Question:* What will they be saying in two generations about what is the biggest problem with what we’re doing?
- *Answer:* We’ll deal with the largest priority problems, but not deal with the longer-term issues.
- *Freeman:* At SRS, we’re just trying to keep buildings stable over time.
- *Question:* Are there other maintenance problems that come up with long-term building “storage” (e.g., mold and mildew)?
- *Answer:* Yes, we try to do things like take out ceiling tiles. Try to determine if there’s a mildew problem.
- *McNeel:* At INEEL, the problem is mice and hantavirus in abandoned buildings. We haven’t gotten to point of just “deactivating.”
- *Question:* Is “short-term thinking” a result of LTS responsibilities not being in contract?
- *Answer:* Contracts don’t include LTS responsibilities. At long-term sites, you can only get DOE interest if you show that you can save money over the current plan for doing it. [Since LTS is not included in baselines for closure sites, no LTS improvement can be shown to lower cost. Any LTS activity represents an increase from baseline, since baseline cost is zero.]
- *Question:* What about the issue of decommissioning of wells on sites like Mound?
- *Response:* The only way to get DOE attention on a LTS issue is to show that it saves money over long-term.
- *McNeel:* At the INEEL, the issues are characterization of wastes on site, movement of materials off site, remote monitoring capability, better flow and transport models.
- *Krause:* At Mound, the issues are data monitoring and dissemination.

### DOE LTS Perspective – Clay Nichols

The current task is the realignment of focus areas into 2 thrust area teams. Next week, a transition team headed by Tom Heenan and Theresa Fryberger will work with Focus Area heads to prepare recommendations on what work has the greatest need to be continued to meet the thrusts. Other parts of the present EM program are being reviewed, including the INEEL portion of LTS. As of now, the LTS program in EM-50 has no budget beyond FY02. Some of the policy effort will go to Bev Cook in ESH. The Office of Management at headquarters may also have part. EMSP is being moved to the Office of Science with the NABIR program and other parts; Theresa Fryberger will be running it. The primary issue is determining what parts of the LTS program should go to OS/ESMP?

### Technology Baseline – Raphael Soto.

Rafael and his team at the INEEL developed a baseline database on DOE sites. He will be available at the back of the room as a resource for the workgroups to do real-time queries on the database. Cost baselines for sites are all over the map; he has very generic costs for LTS, but they vary by 1-2 orders of magnitude between sites. He does have contaminants of concern and other site-specific data.

### Report on SCFA Mid-Year Review –

Dawn Kaback and Mike Serrato (SRS) summarized the SCFA mid-year review. SCFA is disappearing in its formal capacity. PI's from all projects came and gave presentations; people from DOE labs gave technical reviews; and site people gave relevance reviews. Decision on continued funding will be based on whether they fit under Thrust 1 or Thrust 2. The budget for SCFA is going down to \$92 million next year. There is some possibility that projects relevant to LTS might be continued. There is, however, a new category of "closure site projects" for Thrust 1. We need to raise the level of interest of "people" so that the new Thrust 1 category gets put into the budget.

### Instructions to Workgroups regarding Technology Path Development –

Bryan Parker gave instructions for workgroups for developing technology pathways for high impact capabilities. The main charge is to capture "nuggets" for longer-term capabilities and targets but focus on near-term results. Workgroups will reconvene sometime on Wednesday for intergroup interaction.

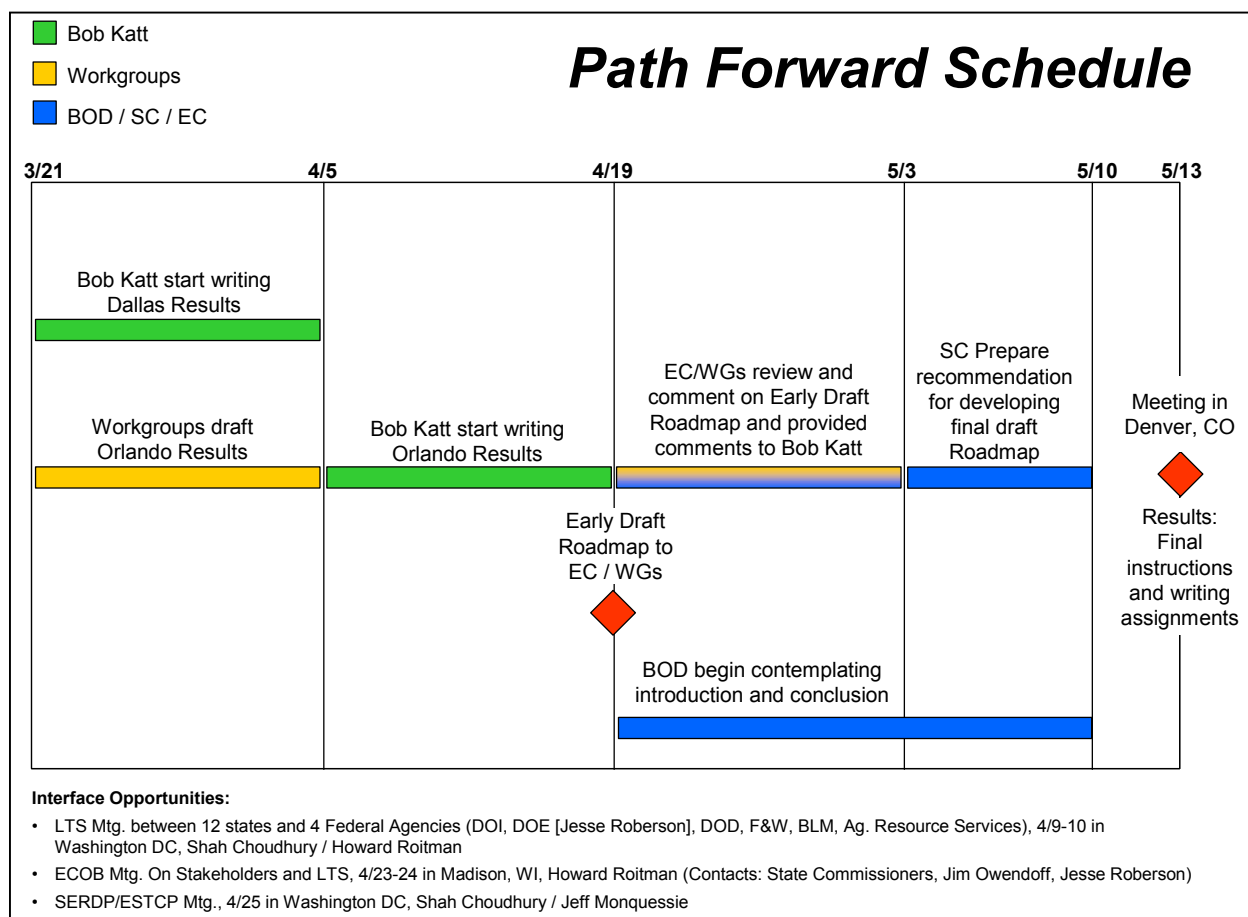
- *Question:* Is there a second component when we will look at issues beyond 2008?
- *Answer:* Our focus is just the shorter-term elements. We will mention the longer-term things but not develop the roadmap for them.

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### Days 3 and 4 – March 20-21

Workgroups spent days 3 and 4 of the workshop in breakout sessions revisiting targets and developing technology pathways; results of these breakout sessions and follow-on homework appear in Attachments A through D. Summary results identifying 17 viable LTS capabilities were prepared for and transmitted to Clay Nichols for use in upcoming discussions with Dave Geiser. This summary presentation appears in Appendix B.

The following Path Forward schedule was developed and distributed to the Workgroup chairs to complete homework assignments and prepare for the May Roadmap Development Workshop.



### Future Meetings

Meetings	Location	Attendees
Roadmap Development Workshop Date: May 13-15, 2001 (purpose: prioritization, draft LTS S&T Roadmap)	Denver, CO	Exec. Committee and selected Workgroup members (May 13-15)
Workshop with Research Community	TBD	TBD

The meeting adjourned on Thursday at 12:00 pm.

## **Appendix A: Key Concerns Raised by WG Chairs Regarding the Proposed Prioritization Process**

### **Path Forward**

- Steering committee will evaluate this prioritization approach offline.
- Talk to Jerry Harbour about the process next week or the following.
- Send the Steering committee Jerry's e-mail.
- Consider waiting until after the roadmap is done to evaluate the prioritization process.

### **Issues**

- There are six weeks from now until the May meeting. It will be hard to review and input to the prioritization process in this amount of time.
  - The Steering Committee wanted to talk to the developers in October and did not heard from anyone.
  - How much input can a team have in six weeks? How good will it be in this short amount of time.
- We have already prioritized and downselected.
- We need to set up some specific dates on what deliverables are due and when in the next six weeks.
- Concern with “simple” process. Complexity may bring a better level of accuracy. Is this DOE or INEEL driven?
- Use the word “straightforward.”
- Determine if “simple” is really desirable and is it achievable?
- Primary focus is on cost, rather than other two goals.
  - Need a better balance.
  - Need a metric on the value of the information.
  - Jerry Harbour has been collecting cost data and it will be demonstrated tomorrow.
  - Have they vetted the cost data?
  - Are the costs organized by type or by facility?
  - It is relational and can be tied to activities?
  - Does this cost data tie to LTS costs? (Yes. Actual costs of on-going operations and projected costs.)
- Baseline cost versus lifetime cost savings (figure of merit?)
- Chart 12 should derive from figures of merit on page 11.
  - 12 shows only weighted risk versus weighted cost. Where is uncertainty?
  - If we are going to make this objective transparent and qualitative, then we need to be careful that it all ties together (no “truck” holes).
- “Evaluation and prioritization of LTS technologies” is the current title of presentation.
- This is too limiting.
- We are looking at more than technologies.
- LTS costs are under estimated because no one includes maintenance.
  - Will the data be available to accurately calculate figures of merit for cost?

- E.g., high dollar containment system with no maintenance versus simple system with regular maintenance (data does not exist).
- What does he mean by NGT and transparency?
- How can this approach accommodate uncertainty?
  - Need a metric on how address uncertainty.
  - A metric for uncertainty reduction may be what is needed. Look as uncertainty merit.
- Concern that it will be difficult to use this tool with our technologies. We need to have an analytical tool that we can develop our LTS costs.
  - One of the things that needs to be done is the research that is needed to do this
  - Some of the things that need to be done may not score very high on this list. There are things that can be done to greatly reduce uncertainty, but they may not rank very high.
- Probability determination (how do all the proposed factors factor in?)  
 Probabilistic/performance modeling as a decision tool.  
 Need to ask Jerry Harbour how he came up with the probabilities.
- What is not caught in this are the relationships of priority.
  - We have critical cost data and we are very close to doing a critical path analysis, which should lead us toward our prioritization.
  - Do we need another formal prioritization process?
  - Looking at the pathways (roadmap) would make it easier to do the prioritization.
  - We can't do this right now.
- Validation of the Prioritization Process
  - Do internal validation with work groups. Prioritization via controlled web access/e-mail?  
 Before May? After May?
  - Could be part of the public comment
    - To do the prioritization, access to the roadmap will be needed.
    - Can different groups use different methods. (There is some requirement to use the same method).
- Does this handle crosscutting issues?

## Appendix B: Revised Activities, Capabilities & Targets DRAFT

The Long Term Stewardship (LTS) Science and Technology Roadmap project currently underway at Idaho has identified a set of high-priority activities and targets that offer prospects for substantial reductions in cost, uncertainty, and human/environmental risk. These activities focus primarily on the sites that are scheduled to close in the next three to five years but apply equally well to LTS activities over the long-term, offering the prospective for even greater savings.

The activities listed below represent a “short list” of activities, grouped by their respective workgroup/area of emphasis. Activities are numbered as they are to maintain traceability to project data generated by workgroups to date. Note that the activities are not ordered by priority rank but are color coded, as follows, to show themes and shared applicability across workgroups.

	Information Technology		System Performance		Adaptation to Changes in Conceptual Models		Sensor / System Hardware Development
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### Definitions:

- **Activity** — A major stewardship activity, as viewed from the perspective of those who plan, budget, and manage the work (e.g. “end-users”) - What you have to do to provide stewardship at a site.
  - **Capability** — Processes/Methods needed to perform the function, as viewed from the perspective of those who do the detailed planning and perform the work (e.g. engineer, technician) – What you must be capable of to perform the work.
  - **Target** — Addresses improvement at the capability level, not the technology level, such that more than one technical approach could be used. Improvement level is meaningful and likely to result in real impact to the LTS program. Improvement level is technically challenging but not impossible to meet; may be incremental or absolute.
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### Decision Making and Institutional Performance

<i>Activity</i>	<i>Capability</i>	<i>Targets</i>
1 (old 5). Improve institutional credibility and community interaction	1.1 (old 5.3). Involving community in conduct of stewardship.	Design and implement a stewardship program in ways that align DOE and community objectives.
	1.2 (Old 5.1). Learning what affects public trust and confidence	Finish case studies of what agency action engender thrust and confidence. Initiate full-scale field use at selected sites.
2. Develop improved reliability/consistency in LTS Institutions	2.1 (was "new 2.7"). Periodically revisit cleanup/ stewardship decisions to ensure continuous improvement	Ensure continuous monitoring and improvement of LTS/cleanup decisions. Improve stakeholder support. Reduce life-cycle costs.
	2.2 [to be formulated from old 2.1, 2.2, 2.3, and 3.2]	Design and implement institutional mechanisms that sustain and improve long-term stewardship.



### ***Safety Systems and Institutional Controls***

<b><i>Activity</i></b>	<b><i>Capability</i></b>	<b><i>Targets</i></b>
1. Develop a finite number of generic, standardized, risk-based, efficient safety systems.	1.1 Develop a methodology for Safety Systems selection.	Deploy draft risk-based technology store by 2004 and final by 2006 to reduce capital and O&M costs by 40%.
		Provide a list of target contaminants by media for development of detection instruments to reduce costs by 40%.
2. Develop and maintain integrity of access control and safety systems.	2.3 System performance module for collection, analysis, evaluation, and dissemination of data (templates).	Issue action criteria for collecting, analyzing, and evaluating representative data for security and exposure systems functionality to reduce cost by 60%.
3. Optimize operational and technical management and administration.	3.1 Validate overall (technical/non-technical) system performance	Issue a model for reassessment of overall safety system effectiveness.
	3.4 Deploy optimal technology options for ensuring the preservation of site information from intergenerational technical continuity and reduce uncertainty.	Deploy intergenerational archive.
4. Define legal strategy.	4.0 Identify potential legal strategies, develop alternative legal draft instruments, assess established agreements, pathway modules.	Provide options for potential legal strategies and associated instruments to facilitate handoff of closed sites to final steward.

### ***Contamination Containment and Control***

<b><i>Activity</i></b>	<b><i>Capability</i></b>	<b><i>Targets</i></b>
1. Limit Contaminant Toxicity and Mobility	1.4a Engineer Biogeochemical Environment (source contaminants)	Deploy alternate technologies that detoxify or immobilize risk-driving contaminants at the source.
	1.4b Engineer Biogeochemical Environment (ground water environment)	Deploy alternate technologies that reduce the volume of ground water that would otherwise have been pumped and/or treated.
2. Limit Intrusion, Transport, Release, and Exposure	2.2a Design, build, and operate alternate containment systems (cover barriers)	Deploy cover systems that mimic natural processes and accommodate environmental change.
	2.2b Design, build, and operate alternate containment systems (subsurface barriers)	Deploy subsurface containment systems that mimic natural processes and accommodate environmental change.
4. Predict, Monitor, and Evaluate System Performance	4.1 Conceptualize and predict system performance and potential failure modes / levels of failure.	Deploy a “toolbox” of techniques and technologies (e.g., models, natural analogues, guidance, performance indicators, failure criteria, etc.) to improve planning, decision making, design, monitoring, maintenance, and interpretation of monitoring data.
5. Maintain System Performance	5.1 Identify and implement improved responses to change (via routine and preventative maintenance that nurtures system performance) and failure (via corrective repair, retrofit, and replacement).	Deploy technologies and protocols that significantly reduce the need for maintenance intervention of installed contamination containment and control system.

### ***Monitoring and Sensors***

<b><i>Activity</i></b>	<b><i>Capability</i></b>	<b><i>Targets</i></b>
1. Develop framework for multimedia	1.1 Monitoring for multimedia as appropriate	Develop technology to fill 30% of identified gaps
	1.2 Conceptual modeling (geologic, hydrologic, biologic, chemical)	Have capability to adapt monitoring system to changes in the conceptual model
2. Design and Emplace Monitoring System	2.3 Identify surrogates/indicator parameters	Application of surrogates at all sites by...
3. Optimize monitoring system	3.1 Optimize networks (spatial and temporal)	80% of LTS sites going to closure use optimization strategy
4. Operations	4.3 Validate system performance	Validate remedial system and monitoring system performance at a LTS site
5. Information Management	5.1 Information collection, assimilation, visualization and dissemination	Have in place at all sites, an information management system that includes or addresses: data collection, validity, access, outreach, education, communication and visualization
6. Sensor Technologies	6.1 Hardware Development (new GHCB methods, wireless, miniaturization, non-invasive, reliability, calibration, remote interrogation)	10% of sensor arrays in field can deliver data wirelessly from subsurface
		In-situ analysis can be done in subsurface for 5 high-risk analytes or surrogates
		Assure that 30 years out 50% of sensors still meet their performance objectives
		Application of volume integrating methods, including non-invasive techniques, will increase to 10% application in areas such as soil moisture and leak detection